MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

BER2094 – ENVIRONMENTAL AND RESOURCE ECONOMICS

(All Sections/Groups)

11 AUGUST 2022
9:00 am – 11:00 am
(2 hours)

INSTRUCTIONS TO STUDENTS

1. This Final Exam consists of **EIGHT (8)** pages including a cover page with Section A and Section B.
2. Section A consists of **TWO (2)** Case Studies. Section B consists of **TWO (2)** Structured Questions.
3. Please **write the answers in the answer booklet** provided.
4. Candidates **MUST** attempt **ALL** questions.
5. The marks distribution for each question is given. Total marks 100.

SECTION A: CASE STUDIES

CASE STUDY 1 (40 marks):

Cleaning Up Electronic Waste (E-Waste)

EPA works bilaterally with governments and environmental officials around the world on e-waste management. U.S. EPA and Taiwan Environmental Protection Administration (Taiwan EPA) coordinate the International E-Waste Management Network (IEMN), which has brought together environmental officials from Asia, Latin America, the Caribbean, Africa, and North America to exchange best practices on e-waste management since 2011.

EPA efforts support the United States government's National Strategy for Electronics Stewardship, which details the federal government's plan to enhance the management of electronics throughout the product lifecycle. EPA also collaborates with the Solving the E-waste Problem Initiative (StEP) to jointly address the e-waste problem in developing countries. Step, formerly known as UNU-Step, was previously an initiative under the United Nations University (UNU). EPA and UNU first signed a cooperative agreement to work together on e-waste in November 2010 and then again in 2015. Some of the work undertaken by UNU-StEP included tracking global flows of e-waste, the Person-in-the-Port project in Nigeria, optimization of an e-waste dismantling facility in Ethiopia, and the development of a tool to help gather information on volumes of e-waste generated within countries and exported to others. EPA is a founding member of the StEP Initiative and serves on the StEP Supervisory Committee.

What is E-Waste?

"E-waste", "electronic waste", "e-scrap" and "end-of-life electronics" are terms often used to describe used electronics that are nearing the end of their useful life, and are discarded, donated, or given to a recycler. Though "e-waste" is the commonly used term, EPA considers e-waste to be a subset of used electronics and recognizes the inherent value of these materials that can be reused, refurbished, or recycled to minimize the actual waste that might end up in a landfill or improperly disposed in an unprotected dump site either in the US or abroad.

An undetermined amount of used electronics is shipped from the United States and other developed countries to developing countries that lack the capacity to reject imports or to handle these materials appropriately. Without proper standards and enforcement, improper practices may result in public health and environmental concerns, even in countries where processing facilities exist.

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We have serious concerns about the unsafe handling of used electronics and e-waste, in developing countries, that results in harm to human health and the environment. For example, there are problems with open-air burning and acid baths being used to recover valuable materials from electronic components, which expose workers to harmful substances. There are also problems with toxic materials leaching into the environment. These practices can expose workers to high levels of contaminants such as lead, mercury, cadmium, and arsenic, which can lead to irreversible health effects, including cancers, miscarriages, neurological damage, and diminished IQs.

EPA estimates that, in 2009, US consumers and businesses discarded televisions, computers, cell phones, and hard copy peripherals (including printers, scanners, and faxes) totaling 2.37 million tons. Approximately 25 percent of these electronics were collected for recycling, with the remainder disposed of primarily in landfills, where the precious metals cannot be recovered.

Understanding the Problem

Better data are needed to create a more comprehensive picture of the overall trade flows. Accurate information about the amounts, types of materials, and destinations of used electronics exported will provide valuable information for the Federal government, private industry, and other stakeholders.

To this end, EPA funded UNU-StEP to lead a study on US exports of used electronics in an attempt to better define the US contribution to the overall e-waste problem. StEP collaborated with the Massachusetts Institute of Technology (MIT) and the National Center for Electronics Recycling (NCER). A workshop in July 2011 in Washington, DC gathered input from stakeholders and helped chart a path forward. In December 2013 the final study, Quantitative Characterization of Domestic and Transboundary Flows of Used Electronics, was released. It presents a methodology for using existing trade data to calculate US exports and lays out challenges and options for future data-gathering efforts. In October 2016 the North American Commission on Environmental Cooperation (CEC) released another study by MIT identifying the flow of electronics trade from and within North America. This study involved assessing and mapping flows of electronics, including those exported from the U.S. for recycling, reuse, and refurbishment.

Building Capacity in Developing Countries and Sharing Best Practices

Managing the e-waste created by an increasing amount of computer and telecommunication equipment is important to the government, and many international partners have worked to help address this concern.

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In 2010, EPA provided funds to the United Nations University (UNU) to assess e-waste in Ethiopia. The assessment was carried out by Germany's Oeko Institute. Based on the results, the Global Environment Facility (GEF) invested $1 million in a project to strengthen Ethiopia's capacity to manage e-waste. This was the GEF's first investment in the e-waste issue. The EPA and GEF projects build upon a previous World Bank-funded initiative aimed at enhancing Ethiopia's Information and Communication Technology (ICT) sector.

Through this multi-year effort, EPA, UNU-Solving the E-waste Problem (StEP), and the GEF assessed the state of e-waste in Ethiopia, studied national and international downstream markets for certain e-waste components, and identified financing models for sound e-waste management in Ethiopia. The project also strengthened the capacity of a demanufacturing facility to process e-waste in Addis Ababa.

The United Nations Industrial Development Organization (UNIDO) was the overall manager of the GEF project, with UNU-StEP's Initiative team serving as the technical experts. EPA served as an international advisor to an Ethiopian working group on e-waste management during the course of this work. The project ended in late 2016.

Source: United States Environmental Protection Agency (EPA), 2 November 2021
https://www.epa.gov/international-cooperation/cleaning-electronic-waste-e-waste

Based on the above article, answer the following questions:

a) Refer to the article, explain any **TWO (2)** efforts conducted by EPA to address the e-waste problem. (6 marks)

b) With not more than 100 words, explain why e-waste is an environmental issue. (10 marks)

c) *EPA efforts support the United States government's National Strategy for Electronics Stewardship, which details the federal government's plan to enhance the management of electronics throughout the product lifecycle.*

What is the product lifecycle? Suggest an emerging sustainable approach or initiative that can be adapted by the electronics firms to reduce e-waste pollution (4 marks)

d) Suggest a suitable market-based instrument that can be adopted by the government to encourage the recycling of e-waste. Discuss with the aid of a diagram. (10 marks)

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e) *An undetermined amount of used electronics is shipped from the United States and other developed countries to developing countries that lack the capacity to reject imports or to handle these materials appropriately.*

Examine any **TWO (2)** challenges that need to be overcome by developing countries in managing the used electronics waste imported from the developed countries.
(6 marks)

f) Why aren't developed countries recycling their own waste? Evaluate any **TWO (2)** causing factors. (4 marks)

CASE STUDY 2 (40 marks):

The implications of food price inflation on food security in Malaysia

THE continuous rise in food price inflation not only affects the purchasing power and income of the increasingly squeezed M40 (middle 40% income group) and perennially struggling B40 (bottom 40% income group) — which materially and adversely impacts household and private sector spending at a time when we are supposed to be in the endemic phase (ie steadily recovering from the economic impact of the lockdowns) — but also exacerbates our food security problem.

Increasing food price inflation entails and means that households and private sectors would need to increase savings to cope with expected or anticipated future shocks — in a global environment fraught with uncertainty and externally-driven inter-related dynamics that are increasingly complex. This analysis makes for grim reading — especially in the form of a precarious economic and financial situation of over-leveraged households and the private sector where the trade-off in the holdings of financial assets between the banks (creditors) and borrowers (debtors) becomes apparent.

If the private sector on the whole wishes to save and accumulate more savings (as in liquid assets), then an increase in interest rates (via the Overnight Policy Rate or OPR) negates the desire (by eating into disposal income) although beneficial to banks in the form of de-compressing the net interest margin. On the contrary, lowering the interest rates enables the households and private sector to save more, although at the expense of the banks (which are already making huge profits, anyway). And with the minimum wage rate implementation of RM1,500 per month in place, producers who operate their farms might have to reduce the number of local workers employed in order to lower the operating cost. Current difficulties in hiring foreign workers further complicate the labor shortage issue faced by producers. A lower number of workers could lead to lower production levels and, by extension, lower supplies — thus resulting in price hikes.

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Although we no longer experience the roadblock measures and limitations of market operating hours as happened during the lockdowns, supply-side and supply-chain disruptions persist externally — not least due to lockdown measures in major ports such as Shanghai and its domestic counterparts causing the logistical congestion.

All of these contribute to the inflationary momentum and pressures.

Notwithstanding, Malaysia is rich in natural resources, including fertile land for agriculture. However, over-reliance on imported food (especially non-rice agro-food) has put our self-sufficiency ratio (SSR) on a downward and shrinking trend.

The Department of Statistics Malaysia's Supply & Utilisation Accounts Selected Agricultural Commodities 2016-2020 indicated that the lockdown measures resulted in lesser food items recording SSRs of more than 100% in 2020. Only 19 food items recorded over 100% of SSR in 2020, compared to 25 in 2019. Among the food items that recorded less than 100% of SSR are mutton (9.6%), ginger (18.9%), mango (20.2%), beef (22.2%), chilli (30.9%), round cabbage (37.5%), fresh milk (65.0%), rice (63.0%), coconut (66.6%), sweet potato (75.6%) and sardine (80.7%). In 2020, Malaysia imported RM55.5 billion in food products, compared to RM33.8 billion of exports — translating to a large deficit of RM21.7 billion. Such a trend is worrying as over the last decade, food imports in Malaysia have accumulated to RM482.8 billion, while exports amounted to RM296 billion.

Climate change — which has resulted in unprecedented downpours, eg on Dec 17, 2021 — has led states such as Kelantan, Terengganu, Pahang, Perak, Negri Sembilan, Melaka, Kuala Lumpur, and Selangor to experience severe flooding. Around 5,000 livestock breeders and farmers were affected, causing nearly RM67.72 million in losses to the agro-food sector.

The latest Global Food Security Index 2021 from the Economist Intelligence Unit showed that Malaysia ranked 39th, which is far behind the UK (3rd), Finland (4th), Netherlands (6th), Japan (8th), the US (9th), Singapore (15th), Qatar (24th) and Kuwait (30th), as examples. Despite Malaysia recording a slight improvement from the overall score of 68 in 2020 to 70.1 in 2021, the country scored "availability" and "natural resources and resilience" dimensions poorly — at 64.0 and 46.6 respectively. For the remaining two dimensions, namely "affordability" and "quality and safety", Malaysia scored 85.6 and 76.3 respectively. These indicators point to Malaysia's long-standing structural problems in terms of import dependency and balance of payments (BOP) deficit for food items.

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With the ongoing Russia-Ukraine conflict coupled with a currency that has been on the depreciating side, our BOP deficit continues to be aggravated by markups from the cost-push inflation that in turn worsens the cost of doing business and cost of living. According to the United Nations Comtrade database on international trade, Russia is the third top trading partner of Malaysia for the import of "mineral or chemical fertilizers, phosphatic" at US$4.77 million (RM20.18 million), with a share of 16.2%. Western sanctions on Russia have led to a shortage of fertilizers worldwide, thus increasing the cost of animal feed and crops in Malaysia. Subsequently, local livestock breeders and farmers had to charge retailers/consumers higher selling prices to compensate for the rising cost of feeding ingredients such as corn, soybeans, and wheat aside from the minimum wage increment of RM300 per month per employee starting from May 1 onwards.

We should adopt Singapore's approach to food security: Increasing the ratio of food supplied by 2030 via urban farming (including growing vegetables on embankments of canals and also on floating rafts as part of flood management etc) and integrating agriculture with aquaculture. Focusing on high-quality vegetables, fruits, animal proteins, and fish farmed locally would generate higher value-added activities and create a positive spillover effect along the food supply chain. Our vision of food security should be based on creating interconnected food chains within the ecosystem — ensuring every Malaysian is able to afford to purchase high-quality food and enjoy sufficient nutritious food intake on a daily basis.

Source: Amanda Yeo - May 10th, 2022
https://themalaysianreserve.com/2022/05/10/the-implications-of-food-price-inflation-on-food-security-in-malaysia/

Based on the above article, answer the following questions:

a) With not more than 200 words, provide a summary of the above article. (10 marks)

b) Based on the article, evaluate any **TWO (2)** causing factors of food price inflation in Malaysia. (10 marks)

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c) *Despite Malaysia recording a slight improvement from the overall score of 68 in 2020 to 70.1 in 2021, the country scored "availability" and "natural resources and resilience" dimensions poorly — at 64.0 and 46.6 respectively. For the remaining two dimensions, namely "affordability" and "quality and safety", Malaysia scored 85.6 and 76.3 respectively. These indicators point to Malaysia's long-standing structural problems in terms of import dependency and balance of payments (BOP) deficit for food items.*

Suggest a suitable market-based instrument for Malaysia's government to support the local food suppliers and reduce the dependency on imported foods. Discuss with the aid of a diagram. (12 marks)

d) Examine any **TWO (2)** challenges that need to be overcome by Malaysia in adopting urban farming. (8 marks)

SECTION B: STRUCTURED QUESTIONS (20 marks)

QUESTION 1 (10 marks)

Two major manufacturers of air-conditioning, Darqin and Mitsu face the following marginal abatement costs (MAC) for CFCs.

$$MAC_D = 1.4A_D$$
$$MAC_M = 1.6A_M$$

A_D represents the quantity of abatement for Darqin and A_M represents the quantity of abatement for Mitsu. In the aggregate, the two firms do not hold enough CFCs allowances to cover their production activity and must abate a combined level of 40 units.

Should each firm abate 20 units each? Economically explain your answer with MAC justification. Show all your work to support your answer. (10 marks)

QUESTION 2 (10 marks)

Suppose that the Marginal Social Benefit (MSB) and Marginal Social Cost (MSC) of abating Nitrogen Oxides are as the following.

$$MSB = 64 - 0.4A \qquad MSC = 32 + 0.4A$$

a) Since the Environmental Quality Act (EQA) is set using a benefit-based decision rule, calculate the abatement level of Nitrogen Oxides that would follow this rule. (5 marks)

b) Assume that the EQA was legislated to achieve efficiency, and compute the efficient abatement level (A_E) for Nitrogen Oxide. (5 marks)

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